UNITED STATES PATENT APPLICATION

For

AUTOMATED, WRAP-AROUND TELEPHONE DIALING

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AUTOMATED, WRAP-AROUND TELEPHONE DIALING

BACKGROUND

[0001] *Field*

[0002] This disclosure relates to telephone dialing systems, including secondary long-distance carrier services.

[0003] *Description of Related Art*

[0004] Each telephone subscriber must usually select a long distance carrier that the telephone subscriber wishes to handle the long distance calls that are made by the subscriber. Unfortunately, the prices charged by the selected carrier are often higher than what can otherwise be obtained.

[0005] In an effort to give subscribers an opportunity to place long distance calls at a lower cost, without changing its default long distance carriers, several secondary forms of long distance carrier service have emerged.

[0006] For example, long distance calls may be charged to a credit card. To do so, the user must first enter an access code, such as a designated 800 number followed by his credit card number. The number that the user wishes to actually dial may then be entered. (In some cases, the number that the user wishes to dial is entered after dialing the 800 number, but before the credit card number is entered.) After the call is completed, the subscriber may receive a billing statement from the long distance calling card company.

[0007] Another popular approach is to first dial a long distance access code, such as 10 10 221. Thereafter, the subscriber dials the desired long distance number and the charge for the call is placed on the subscriber's telephone bill as a charge to the telephone number represented by the long distance access code.

[0008] All of these secondary approaches to obtaining lower, long distance dialing rates are referred to in this disclosure as "wrap-around" dialing.

[0009] Unfortunately, many subscribers do not make effective use of a less expensive, wrap-around dialing service. Many are simply not aware of the availability of the service. Others may be flustered by the complexity. Still others may not recall

the necessary long distance access code when it is needed. Still others may not be able to readily differentiate between calls that will benefit from wrap-around dialing and calls that will not.

SUMMARY OF INVENTION

[0010] A wrap-around dialer may include a memory for storing a first long distance access code and a processor. The processor may be configured to receive a string of numbers from a dialing device and to deliver the first long distance access code and at least a portion of the string of numbers into a telephone line, if the string of numbers includes a second long distance access code. The processor may also be configured to deliver the full string of numbers into the telephone line without the first long distance access code, if the string of numbers does not include the second long distance access code.

[0011] The processor may be configured to disconnect the dialing device from phone line while receiving at least a portion of the string of numbers from the dialing device.

[0012] The processor may be configured to connect the dialing device to the phone line after receiving at least a portion of the string of numbers.

[0013] The first long distance access code may be different from the second long distance access code.

[0014] The second long distance access code may be the digit "1" at the beginning of the string of numbers.

[0015] The second long distance access code may be the digits "011" at the beginning of the string of numbers.

[0016] The second long distance access code may be either the digit "1" or the digits "011" at the beginning of the string of numbers.

[0017] The delivered portion of the string of numbers may be the string of numbers without the second long distance access code.

[0018] The processor may be configured to deliver the first long distance access code into the telephone line before the portion of the string of numbers.

[0019] The processor may be configured to begin delivering the first long distance access code into the telephone line while there is a dial tone on the telephone line.

[0020] The dialing device may be a telephone.

[0021] The dialing device may be integral with the wrap-around dialer.

[0022] A wrap-around dialer may include means for storing a first long distance access code, means for receiving a string of numbers from a dialing device, means for delivering the first long distance access code and at least a portion of the string of numbers into a telephone line if the string of numbers includes a second long distance access code, and means for delivering the full string of numbers into the telephone line without the first long distance access code if the string of numbers does not include the second long distance access code.

[0023] A wrap-around dialing process may include receiving a string of numbers from a dialing device, delivering a first long distance access code and at least a portion of the string of numbers into a telephone line when the string of numbers includes a second long distance access code, and delivering the full string of numbers into the telephone line without the first long distance access code when the string of numbers does not include the second long distance access code.

[0024] The process may include disconnecting the dialing device from the phone line while receiving at least a portion of the string of numbers from the dialing device.

[0025] The process may include connecting the dialing device to the phone line after receiving at least a portion of the string of numbers.

[0026] The first long distance access code may be different from the second long distance access code.

[0027] The second long distance access code may be the digit "1" at the beginning of the string of numbers.

[0028] The second long distance access code may be the digits "011" at the beginning of the string of numbers.

[0029] The second long distance access code may be either the digit "1" or the digits "011" at the beginning of the string of numbers.

[0030] The delivered portion of the string of numbers may be the string of numbers without the second long distance access code.

[0031] The process may include delivering the first long distance access code into the telephone line before the portion of the string of numbers.

[0032] The process may include beginning the delivery of the first long distance access into the telephone line while there is a dial tone on the telephone line.

[0033] The dialing device may be a telephone.

[0034] These, as well as other objects, features and benefits will now become clear from a review of the following detailed description of illustrative embodiments and the accompanying drawings.

BRIEF DESCRIPTION OF DRAWINGS

[0035] FIG. 1 is a block diagram of an embodiment of a wrap-around telephone dialer that is separate from a dialing device.

[0036] FIG. 2 is a flow diagram of an embodiment of a wrap-around dialer.

[0037] FIG. 3 is a block diagram of an embodiment of a wrap-around telephone dialer that is integral with a dialing device.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0038] FIG. 1 is a block diagram of an embodiment of a wrap-around telephone dialer that is separate from a dialing device.

[0039] As shown in FIG. 1, a wrap-around telephone dialer **101** may include a dialing device **110** that is connected through a connector **112** to a decoder **118**, a detector **152** and a relay **116** . The decoder **118** may be configured to decode multi-frequency dialing tones, pulses or any other form of dial encoding coming from the dialing device **110** and to deliver that decoded information to a processor **124** . The processor may include a microprocessor or a microcontroller. The detector **152** may be configured to detect an "off-hook" condition in the dialing device **110** and to deliver that information to the processor **124** .

[0040] The dialing device **110** may be a telephone, a cell phone, a PC, or any other type of device that is capable of dialing telephone numbers. The embodiment of the

wrap-around dialer in FIG. 1 is configured to work with a telephone and may be modified in ways that will become apparent if another type of dialing device is used.

[0041] A program switch **126** may be in communication with the processor **124** for the purpose of controlling the mode of the processor **124** and, in particular, for switching the processor **124** between a normal operation mode and a programming mode. During the normal mode, numbers to be dialed may be entered into the dialing device **110**. During the programming mode, an access code may be programmed into the wrap-around telephone dialer **101**.

[0042] A memory **128** may be in communication with the processor **124** . Among other information, the memory **128** may hold a long distance access code that may be used by the processor **124** in the manner described below. The memory may include a non-volatile memory.

[0043] The relay **116** in the powered state shown in FIG. 1 may connect the dialing device **110** to a telephone line **144** through a connector **142**. When switched to its opposite state, the relay **116** may disconnect the dialing device **110** from the telephone line **144** and, instead, may connect the dialing device **110** to an independent source of power **119**.

[0044] A relay **136** may also be provided that acts in association with a load **138**, such as a resistor, to impose a load in its un-powered state on the telephone line **144**. From the perspective of the telephone line, the load may look similar to the load that is normally presented by the dialing device **110** when it is "off hook."

[0045] Both relays may be connected in parallel, as shown in FIG. 1. When power is applied to both, the relay **116** may connect the dialing device **110** to the telephone line **144**, while the relay **136** may remove the load **138** from the telephone line. When power is removed, the relay **116** may cause the dialing device **110** to be removed from the telephone line **144**, while the relay **136** may cause the load **138** to be placed across the telephone line **144**.

[0046] An encoder **134** may be provided to encode numbers generated by the processor **124** for delivery into the telephone line **144**. The encoder **134** may produce

multi-frequency dialing tones, dialing pulses or any other form of coding. The coding may be compatible with the encoding needed by the telephone line.

[0047] An AC/DC converter **146** and an internal power supply **140** may also be provided to generate the power for one or more of the components in the wrap-around telephone dialer **101**.

[0048] FIG. 2 is a flow diagram of an embodiment of a wrap-around telephone dialer. FIG. 2 will now be described in conjunction with the embodiment of the wrap-around telephone dialer **101** shown in FIG. 1. The same process or different processes may also be applies to other embodiments.

[0049] As shown in FIG. 2, the dialer shown in FIG. 1 may first go through an initialization and configuration step after power is applied, as shown in an Initialization Configuration block **310**. The processor **124** may then test to determine whether the program switch **126** is on, as reflected by a Program Switch On? decision block **314**. If the program switch **126** is on, this may indicate that the user of the wrap-around telephone dialer **101** wishes to program the wrap-around telephone dialer **101** with a wrap-around long distance access code, such as 10 10 221 or a credit card 800 number followed by the credit card number. To facilitate this, a variable indicating the access code length ACL may be initialized by the processor **124** to be equal to 0, as reflected by an ACL=0 block **334**.

[0050] The processor **124** may next test to see whether the decoder **118** has decoded a number dialed by the dialing device **110**, as reflected by a Digit Received? decision block **336**. If such a digit has been detected, this means that the subscriber has entered a digit of the long distance access code. In this instance, the stored length of the long distance access code ACL may be incremented and the entered digit may be stored in an array that represents the long distance access code, as reflected by an ACL=ACL+1 and KeyArray [ACL]= Digit block **338**.

[0051] The processor **124** may next test to see whether the access code length equals a maximum access code length that the system may permit, as reflected by an ACL=MAXACL? decision block **340**. If it does not, the processor **124** may next check whether the program switch **126** has been switched off, as reflected by a Program

Switch Off? decision block **342**. If the Program Switch **126** is still on, the processor may return to the Digit Received? decision block **336** to receive and store further digits of the long distance access code.

[0052] If the Digit Received? block fails to receive a new digit, the processor **124** may next determine whether the program switch has been turned off, as reflected by the Program Switch Off? decision block **342**.

[0053] Once the maximum allowable length of the long distance access code ACLMAX has been entered, the ACL=MAXACL? decision block **340** may be answered by the processor **124** in the affirmative. Thereafter, the entire value of the KeyArray and its length may be stored in the memory **128**, as reflected by a Store KeyArray and ACL to Memory block **332**.

[0054] From the subscriber's perspective, the subscriber may turn the program switch **126** on and then enter the access code, such as 10 10 221 or the 800 number of his credit card followed by the credit card number. The striking of the "#" key or some other key may be interpreted by the processor **124** as a pause instruction, to be used later in dialing, as described below. Once the user enters the maximum allowable number of long distance access code digits or switches the program switch **126** off, the long distance access code that he enters may be stored in the memory **128**. Of course, the processor **124** may also be configured to allow this entire process to be repeated, and thus for a stored long distance access code to be changed.

[0055] When the program switch **126** is off, the processor **124** may check whether the dialing device **110** has been taken off hook and whether there is a dial tone, as reflected by a Load Det. and Dial Tone? decision block **316**. The detector **152** may perform this function and provide the results of its analysis to the processor **124** . The decoder **118** may also be involved in this process, particularly in connection with the detection of the dial tone.

[0056] Once a determination has been made that the dialing device **110** has been taken off hook and that there is a dial tone, the processor **124** may ready itself to analyze the digits that are delivered from the dialing device **110** for the purpose of determining whether a long distance call is being placed. If so, and as will now be

seen, the processor **124** may cause the stored long distance access code to be injected into the digits that are delivered into the telephone line **144**, followed by the long distance number that is dialed. If the processor **124** determines that a long distance number has not been dialed, on the other hand, only the number that has been dialed may be delivered to the telephone line **144**. The long distance access code may not be included.

[0057] As a first step in the analysis process, certain internal variables may be initialized.

[0058] One variable that may be initialized is a "Mode" variable. The mode variable may indicate the state of the analysis process. A Mode value of "0" may indicate that the first digit is being analyzed. A Mode value of "1" may indicate that the first digit has been analyzed and was found to be a "0." A Mode value of "2" may indicated that the second digit has been analyzed and found to be a "1."

[0059] Another variable that may be initialized is the "Line Control." A value of "0" may mean that the relay **116** should be opened so that the dialing device **110** is not connected to the telephone line **144**. A value of "0" may mean that the relay **116** should be closed so that the dialing device **110** is connected to the telephone line **144**.

[0060] A "Count" variable may also be used to monitor the delay between digits that are received from the dialing device **110**. If the delay exceeds a threshold amount, the dialing device **110** may be disconnected from the telephone line **144**. The specific details of these operations will now be described.

[0061] After determining that the dialing device **110** has been taken off hook and that there is a dial tone, as reflected by the Load Det. and Dial Tone? decision block **316**, the Mode, Line Control and Count variables may be initialized to "0," as reflected by a Mode = 0, Line Control = 0 and Count = 0 block 318.

[0062] Setting the Line Control to 0 may cause the switch **316** to open the connection between the dialing device **110** and the telephone line **144**, while at the same time causing the load **138** to be placed across the telephone line **144** through the actuation of the relay **136**.

[0063] The processor **124** may next seek to determine whether a digit is received from the dialing device **104**, as detected by the decoder **118**, as reflected in a Digit Received? decision block **322**. If a digit is not received, the count may be incremented, as reflected by a Count = Count + 1 block **324**. The incremented count may then be compared to a threshold, such as 2 seconds, as reflected by a Count > 2 sec? decision block **326**. If the threshold has not been reached, the processor **124** may cause the processor **124** to continue to wait for a digit from the dialing device **110**. If the threshold has been reached, on the other hand, the Line Control may be set equal to 1, as reflected by a Line Control = 1 block **330**, thus connecting the dialing device **110** to the telephone line **144**.

[0064] Once a digit is received from the dialing device **110**, a determination may next be made as to the value of the Mode parameter, as reflected by a Mode? determination block **348**. As explained above, the Mode variable is initialized to 0, as reflected by the Mode = 0, Line Control = 0 and Count = 0 block **318**. Thus, the first time the value of the Mode variable is tested by the Mode? decision block **348**, the value may be 0.

[0065] The processor **124** may next examine the value of the digit that has been received from the dialing device **110**, as reflected by a Digit? decision block **354**. If the value is a digit other than a 1 or 0, this may indicate that a local call is being made. In this event, the Line Control value may be set to 1, as reflected by the Line Control = 1 block **330**, causing the dialing device **110** to be directly connected to the telephone line **144**. In this case, the full string of numbers from the dialing device **110** may be delivered directly into the telephone line **144**, followed by the normal types of communication. The processor **124** may operate quickly enough such that the first digit is also delivered into the telephone line **144**. Alternatively, the processor **124** may inject the first digit into the telephone line **144** by directing the encoder **134** to do so. Alternatively, the processor **124** may delay the connection of the dialing device **110** to the telephone line **144** until after the processor **124** receives the full string of dialed numbers from the dialing device **110**. In this embodiment, the processor **124** may direct the encoder **134** to simply rebroadcast that same string of dialed numbers from

the dialing device **110** into the telephone line **144** and, thereafter, to connect the dialing device **110** to the telephone line **144**.

[0066] If the first digit that is received from the dialing device **110** is a 1, on the other hand, this may mean that a long distance call within the United States is being dialed and that the subsequent digits represent the actual telephone number that is desired. In this instance, the processor **124** may be configured to deliver the long distance access code that is stored in the memory **128** to the encoder **134** for delivery into the telephone line **144**, as reflected by the Send KeyArray to Encoder block **360**. The actual number being dialed may then follow. Subsequent numbers may be sent directly from the dialing device **110** into the telephone line **144**, in which case the relay **116** may be activated after the detection of the initial "1." Alternatively, the processor **124** may receive the full string of numbers from the dialing device **110** and then cause that string to be replicated and sent to the telephone line by issuing appropriate instructions to the encoder **134**.

[0067] The initial "1" may or may not be included with the string of numbers that is actually delivered into the telephone line, depending upon the requirements of the wrap-around long distance carrier service. The "1" may be supplemented or replaced by additional codes, again depending upon the requirements of the wrap-around long distance carrier.

[0068] If the first digit from the dialing device **110** is a "0," on the other hand, this indicates the possibility of a long distance call outside of the United States. In this event, the processor **124** may change the value of the Mode variable to 1, as reflected by a Mode = 1 block **356**. The processor **124** may then return to receive the next digit from the dialing device **110**, as reflected by the Digit Received? decision block **322**.

[0069] If the next digit is received within the deadline of the Count, a decision may next be made as to whether the second digit is a "1," as reflected by a Digit = 1 decision block **352**. If the second digit is a 1, this continues to indicate the possibility of a long distance call outside of the United States. In this event, the Mode variable may be set to 2, as reflected by a Mode = 2 block **350** and the processor **124** is ready to receive the third digit, as reflected by the Digit Received? decision block **322**.

[0070] If a third digit is received within the deadline of the Count, the processor **124** may next determine whether the third digit is also a "1," as reflected by a Digit = 1? decision block **346**. If it is, this may indicate that a long distance call outside of the United States is desired. In this instance, the processor **124** may proceed to inject the long distance access code that is stored in the memory **128** into the telephone line, as reflected by the Send KeyArray to Encoder block **360**. The remaining digits from the dialing device **110** may also be entered into the telephone line **144** in accordance with one of the procedures discussed above in connection with the long distance call that is being dialed in the United States. If either the second or third digits are not a "1," after having first received a "0," this may indicate that a long distance call is not being placed. In this event, the full string of digits may then be delivered into the telephone line **144** without the long distance access code, as discussed above following the receipt of an initial digit that is not a "0" or a "1."

[0071] As illustrated in FIG. 1, the dialing device **110** may be separate from the wrap-around dialer **101**. In this embodiment, the dialing device **110** may be connected to the wrap-around telephone dialer through a connector **112**, and the wrap-around dialer may be connected to the telephone line through a connector **142** and to the AC/DC converter **146** through a connector **150**.

[0072] The actual separation distance between wrap-around telephone dialer **101** and the dialing device **110** may be small, such that the two units are next to one another, or may be large, such that the two units are in different rooms. Indeed, the wrap-around telephone dialer **101** may be located in a different building from the dialing device **110**, such as within a local telephone company central office. In this later case, the local telephone company might offer the wrap around dialer as an optional service. The system might be configured to allow the subscriber to remotely program the wrap around dialer from his home entering, for example, a special code (or dialing a special number) to place the system in the programming mode.

[0073] A single wrap-around telephone dialer, such as the one shown in FIG. 1, may also be multiplexed between a plurality of dialing devices using appropriate multiplexing technology. The wrap-around telephone dialer could also be a node on a network system, such as a LAN, WAN and/or the Internet.

[0074] The wrap-around auto dialer may also be configured to contain an integral dialing device, as shown in FIG. 3. FIG. 3 is a block diagram of an embodiment of a wrap-around telephone dialer that is integral to a dialing device.

[0075] The components in FIG. 3 are the same as in FIG. 1, with the following exceptions. First, there may be no external dialing device. Instead, a telephone handset **232** may be connected to a speech network **226** that processes the signals to and from the handset **232** in accordance with well known techniques. The keypad that is often a part of the dialing device may be included as a separate component in the integral embodiment in FIG. 3 and, in particular, as a keypad **212**. There may be no need for a decoder and detector, as the integral nature of the circuitry allows the processor **211** to be fully aware of the status of the dialing effort by virtue of the connection of the keypad **212** to the processor **211**. The integral wrap-around auto dialer **201** may be connected to the telephone line **250** through a connector **238**. It may similarly be connected to an AC/DC converter **244** that is connected to a source of power through a plug **246** through a connector **242**. There may also be no need for relays, but rather only an on/off hook switch **234**. All other aspects of the processor **211** may function in the same or comparable way as described above in connection with the processor **124** in FIG. 1. A voice recognition system may also be added or used instead of the keypad **212** to allow desired numbers to be requested by voice.

[0076] The various components and process steps may be implemented with a broad variety of technology, including hardware, software, and combinations of both. The processing components may be dedicated to the function of the wrap-around auto dialer or may be part of a more generalized computing system, such as a PC.

[0077] Although the long distance access code has thus-far been described as being injected into the telephone line as a prefix, followed by the actual number to be dialed, the reverse sequence or another sequence may also be employed.

[0078] Certain tests could also be eliminated or added. For example, the test for the maximum length of the KeyArray variable might be eliminated, as well as the Count test for a threshold delay between dialed digits.

[0079] Similarly, although the discussion has thus-far focused on a single long distance access code, multiple access codes could be entered and stored in the wrap-around telephone dialer. In this embodiment, different access codes might be used at different times or in connection with different strings of numbers from the dialing device, all possibly to facilitate maximum savings. For example, one access code might be the least expensive for overseas long distance calls while another might be the least expensive for U.S. long distance codes. In such a case, the dialer may be configured to accept two access codes, one for long distance calls within the U.S. (typically signaled by a "1" as the first digit) and the second for long distance calls outside of the U.S. (typically signaled by a "011" as the first digits).

[0080] Similarly, although only the initial digits of the string of numbers from the dialing device have been examined for the purpose of determining whether a long distance call is being made, other embodiments could examine other digits in addition or instead, such as digits at the end of the string.

[0081] In short, the concepts, features, benefits and processes that have thus-far been described are merely illustrative. Protection is limited solely by the claims that now follow and their equivalents.